

**IN THE CLAIMS:**

1.-2. (canceled)

3. (previously presented) A method for one of delivering and withholding delivery of an extra-systolic stimulation cardiac pacing therapy, comprising:  
sensing electrical activity of a heart to provide a heart rate signal for said heart;  
correlating the heart rate signal and an extra-systolic interval for an extra-systolic stimulation therapy to a data set having at least a plurality of heart rates and a plurality of extra-systolic intervals; and  
based on the correlation either delivering or inhibiting delivery of the extra-systolic stimulation therapy,  
wherein the data set includes empiric heart rate-based guidance for refractory period changes of a chamber of the heart for a plurality of heart rates, and evoked response information, and wherein said information is derived from measurements of an evoked response from the extra-systolic stimulation therapy, said information establishing, for at least one cardiac cycle, a refractory period of the chamber of the heart.

4. (original) A method according to claim 3, wherein said information comprises at least one of: an evoked R-wave response, an evoked R-wave timing parameter, an evoked R-wave morphology characteristic, an evoked P-wave response, an evoked P-wave timing parameter, an evoked P-wave morphology characteristic, an evoked T-wave response, an evoked T-wave timing parameter, an evoked T-wave morphology characteristic, a ventricular pressure signal, an atrial pressure signal, a change of magnitude of a maximum derivative of the ventricular pressure signal, a change of magnitude of a maximum derivative of the atrial pressure signal.

5. (previously presented) A method according to claim 3, wherein at least some of said plurality of correlated heart rates and extra-systolic intervals incorporate reduced extra-systolic intervals for a set of relatively higher heart rates.
6. (previously presented) A method according to claim 3, wherein at least some of said plurality of correlated heart rates and extra-systolic intervals incorporate increased extra-systolic intervals for a set of relatively lower heart rates.
7. (original) A method according to claim 5, wherein said correlated heart rates and extra-systolic intervals incorporate a security-timing margin for a tachycardia induction portion of the data set.
8. (currently amended) A method according to claim 3, wherein the data sets incorporates information regarding a predicted degree or a measured degree of a stroke volume augmentation resulting from at least some discrete combinations of the ~~correlated data sets~~.
9. (currently amended) A method according to claim 3, wherein ~~at least some of the correlated data sets~~ incorporates information regarding enhanced arrhythmia detection.
10. (currently amended) A method according to claim 9, wherein ~~for at least some of the correlated data sets that~~ includess potential for a masked tachycardia rhythm, ~~and~~ further comprising:  
periodically withholding delivery of the extra-systolic stimulation therapy or decreasing the extra-systolic interval.

11. (original) A method according to claim 9, further comprising: intermittently withholding delivery of the extra-systolic stimulation therapy for at least one cardiac cycle for every N cardiac cycles to expose a masked tachycardia rhythms, wherein N comprises a non-zero integer.

12. (original) A method according to claim 9, wherein the information regarding enhanced arrhythmia detection includes a reduced electrogram blanking period following delivery of a cardiac pacing stimulation pulse or an extra-systolic stimulation pulse.

13. (original) A method according to claim 12, wherein the reduced electrogram blanking period includes a cross-chamber blanking period and a same-chamber blanking period.

14. (previously presented) A method according to claim 12, wherein the reduced blanking extends at least one arrhythmia sensing interval for at least a portion of relatively higher heart rates mapped to a table.

15. (currently amended) A method according to claim 3, wherein ~~at least a portion of the correlated data sets~~ incorporates information regarding a diastolic compromise condition.

16. (previously presented) A method according to claim 3, wherein for a plurality of relatively low heart rates: delivering the extra-systolic stimulation therapy for every cardiac cycle; and for a plurality of relatively high heart rates: withholding delivery of the extra-systolic stimulation therapy.

17. (currently amended) A method according to claim 16, further comprising:  
applying an alternate paced heart rate during delivery of the extra-systolic  
stimulation therapy wherein the ~~correlated data sets are~~ is disposed  
in, or proximate to, a region of a possibly masked tachycardia  
rhythm;  
comparing the alternate paced heart rate to the correlated heart rate to  
determine if the alternate paced heart rate is about double or about  
half of the correlated~~the mapped~~ heart rate; and  
in the event that the alternate paced heart rate is about double or one-half  
of the ~~mapped correlated~~ heart rate, withholding delivery of the  
extra-systolic stimulation therapy.
18. (original) A method according to claim 17, further comprising:  
applying an arrhythmia detection technique; and  
in the event that an arrhythmia is detected, attempting to terminate the  
arrhythmia.
19. (original) A method according to claim 18, wherein attempting to  
terminate the arrhythmia comprises at least a one of: providing an anti-  
tachycardia pacing therapy, providing a cardioversion therapy, providing a  
defibrillation therapy, providing a burst-type pacing therapy, providing a ramp-  
type pacing therapy.
- 20.-22. (canceled)
23. (previously presented) A method according to claim 25, wherein the table  
includes empiric heart rate-based rules for refractory period changes of a  
chamber of the heart for a plurality of heart rates.
24. (canceled)

25. (currently amended) A method for initiating or gradually suspending delivery of an extra-systolic stimulation cardiac pacing therapy, comprising:

- sensing electrical activity of a heart to provide a heart rate signal for said heart;
- correlating the heart rate signal and an extra-systolic interval for an extra-systolic stimulation therapy to a therapy initiation-and-suspension table containing at least a plurality of heart rates and a plurality of extra-systolic intervals; and
- based on ~~the a~~ mapped location of the heart rate signal on the table and ~~the mapped a corresponding~~ extra-systolic interval either delivering, or inhibiting delivery of, the extra extra-systolic stimulation therapy, wherein the therapy initiation-and-suspension table includes a plurality of therapy transition rules,

wherein one therapy transition rule provides a series of relatively long extra-systolic intervals compared to a cardiac cycle interval for a short period of time following initial delivery of the extra-systolic stimulation therapy and wherein said intervals are progressively shortened as the heart rate decreases during delivery of the extra-systolic stimulation therapy, or

wherein delivery of the extra-systolic stimulation therapy may not be suspended immediately in the event that the heart rate exceeds a pre-established heart rate limit, wherein the table includes evoked response information, said information derived from measurements of an evoked response from the extra-systolic stimulation therapy, said information establishing, for at least one cardiac cycle, a refractory period of the chamber of the heart, and

wherein said information comprises at least a one of: an evoked R-wave response, an evoked R-wave timing parameter, an evoked R-wave morphology characteristic, an evoked P-wave response, an evoked P-wave timing parameter, an evoked P-wave morphology characteristic, an evoked T-wave response, an evoked T-wave timing parameter, an evoked T-wave morphology characteristic, a

ventricular pressure signal, an atrial pressure signal, a change of magnitude of a maximum derivative of the ventricular pressure signal, a change of magnitude of a maximum derivative of the atrial pressure signal.

26. (currently amended) A method according to claim 25, wherein in the event that the heart comprises a part of a chronotropically incompetent hemodynamic system ~~and further comprising:~~  
reducing a rate responsiveness characteristic relative to a detected patient activity signal, so that the resulting rate response slope for a chronotropically incompetent hemodynamic system reflects a wider range of enhanced hemodynamic function over a wider range of heart rates.

27.-29. (canceled)

30. (previously presented) A computer readable medium for causing a programmable processor to perform a method of delivering or withholding delivery of an extra-systolic stimulation therapy, comprising:  
instructions for sensing electrical activity of a heart to provide a heart rate signal for said heart;  
instructions for mapping the heart rate signal and an extra-systolic interval for an extra-systolic stimulation therapy to a table containing at least a plurality of heart rates and a plurality of extra-systolic intervals; and  
based on the location on the table of the mapped heart rate signal and the mapped extra-systolic interval either instructions for delivering, or inhibiting delivery of, the extra extra-systolic stimulation therapy,  
wherein the table includes evoked response information, said information derived from measurements of an evoked response from the extra-systolic stimulation therapy, said information establishing, for at least one cardiac cycle, a refractory period of the chamber of the heart,

wherein the table includes empiric heart rate-based rules for refractory period changes of a chamber of the heart for a plurality of heart rates, and

wherein said information comprises at least a one of: an evoked R-wave response, an evoked R-wave timing parameter, an evoked R-wave morphology characteristic, an evoked P-wave response, an evoked P-wave timing parameter, an evoked P-wave morphology characteristic, an evoked T-wave response, an evoked T-wave timing parameter, an evoked T-wave morphology characteristic, a ventricular pressure signal, an atrial pressure signal, a change of magnitude of a maximum derivative of the ventricular pressure signal, a change of magnitude of a maximum derivative of the atrial pressure signal.

31. (previously presented) A medium according to claim 30, wherein at least some of said plurality of mapped heart rates and extra-systolic intervals incorporate reduced extra-systolic intervals in the event that the heart rate increases.

32. (previously presented) A medium according to claim 30, wherein at least some of said plurality of mapped heart rates and extra-systolic intervals incorporate increased extra-systolic intervals in the event that the heart rate decreases.

33. (previously presented) A medium according to claim 31, wherein said mapped heart rates and extra-systolic intervals incorporate a security-timing margin for a tachycardia induction portion of the table.

34. (previously presented) A medium according to claim 30, wherein at least a portion of the mapped location of the table incorporates information regarding a predicted degree or a measured degree of a stroke volume augmentation resulting from the extra-systolic stimulation therapy.

35. (previously presented) A medium according to claim 30, wherein at least a portion of the mapped locations of the table incorporates information regarding enhanced arrhythmia detection.

36. (currently amended) A medium according to claim 35, wherein in the event that the portion of the mapped locations of the table include potential for a masked tachycardia rhythm, ~~comprising executing one of either instructions for periodically withholding delivery of the extra-systolic stimulation therapy or and instructions for decreasing the extra-systolic interval.~~

37-38. (canceled)

39. (currently amended) A system according to claim ~~41~~<sup>4139</sup>, wherein the data set includes empiric heart rate-based guidance for refractory period changes of a chamber of the heart for a plurality of heart rates.

40. (canceled)

41. (currently amended) A system for delivering or withholding delivery of an extra-systolic stimulation cardiac pacing therapy, comprising:

means for sensing electrical activity of a heart to provide a heart rate signal for said heart;

means for correlating the heart rate signal and an extra-systolic interval for an extra-systolic stimulation therapy to a data set having at least a plurality of heart rates and a plurality of extra-systolic intervals; and ~~based on the correlation either means for one of delivering or inhibiting delivery of the extra extra-systolic stimulation therapy~~  
based on the correlated heart rate signal,

wherein the data set includes evoked response information, said response information derived from measurements of an evoked response from the extra-systolic stimulation therapy, said response information establishing, for at least one cardiac cycle, a refractory period of the chamber of the heart, and



wherein said response information comprises at least one of: an evoked R-wave response, an evoked R-wave timing parameter, an evoked R-wave morphology characteristic, an evoked P-wave response, an evoked P-wave timing parameter, an evoked P-wave morphology characteristic, an evoked T-wave response, an evoked T-wave timing parameter, an evoked T-wave morphology characteristic, a ventricular pressure signal, an atrial pressure signal, a change of magnitude of a maximum derivative of the ventricular pressure signal, a change of magnitude of a maximum derivative of the atrial pressure signal.

42. (currently amended) A system according to claim 41, wherein ~~at least some of said plurality of correlated heart rate signal and said plurality of extra-systolic intervals~~ incorporate reduced extra-systolic intervals for a set of relatively higher heart rates.

43. (currently amended) A system according to claim 41, wherein ~~at least some of said plurality of correlated heart rate signal and said plurality of extra-systolic intervals~~ incorporate increased extra-systolic intervals for a set of relatively lower heart rates.

44. (currently amended) A system according to claim 41, wherein said correlated heart rate signal and said plurality of extra-systolic intervals incorporate a security-timing margin for a tachycardia induction portion of the data set.

45. (currently amended) A system according to claim 41, wherein the data sets incorporates information regarding one of a predicted degree or and a measured degree of a stroke volume augmentation values resulting from at least some discrete combinations of the correlated data sets.

46. (currently amended) A system according to claim 41, wherein ~~at least some of the correlated data sets~~ incorporates information regarding enhanced arrhythmia detection.

47. (currently amended) A system according to claim 46, wherein ~~for at least some of the correlated data sets that includes~~ potential for a masked tachycardia rhythm, and further comprising:

means for one of periodically withholding delivery of the extra-systolic stimulation therapy ~~or~~ and decreasing the extra-systolic interval.

48. (previously presented) A system according to claim 46, further comprising:

means for intermittently withholding delivery of the extra-systolic stimulation therapy for at least one cardiac cycle for every N cardiac cycles to expose a masked tachycardia rhythms, wherein N comprises a non-zero integer.

49. (previously presented) A system according to claim 46, wherein the information regarding enhanced arrhythmia detection includes a reduced electrogram blanking period following delivery of a cardiac pacing stimulation pulse or an extra-systolic stimulation pulse.

50. (currently amended) A system according to claim 49, wherein the reduced electrogram blanking period includes one of a cross-chamber blanking period and a same-chamber blanking period.

51. (currently amended) A system according to claim 49, wherein the reduced electrogram blanking period extends at least one arrhythmia sensing interval for at least a portion of relatively higher heart rates ~~mapped to the table~~.

52. (currently amended) A system according to claim 41, wherein ~~at least a portion of the correlated data sets~~ incorporates information regarding a diastolic compromise condition.

53. (previously presented) A system according to claim 41, further comprising: for a plurality of relatively low heart rates, means for delivering the extra-systolic stimulation therapy for every cardiac cycle; and for a plurality of relatively high heart rates, means for withholding delivery of the extra-systolic stimulation therapy.

54. (currently amended) A system according to claim 53, further comprising:  
means for applying an alternate paced heart rate during delivery of the extra-systolic stimulation therapy wherein the ~~correlated data sets~~ are ~~is~~ disposed in, or proximate to, a region of a possibly masked tachycardia rhythm;  
means for comparing the alternate paced heart rate to the correlated heart rate signal to determine if the alternate paced heart rate is one of about double ~~or~~ and about half of the ~~mapped correlated~~ heart rate;  
and  
in the event that the alternate paced heart rate is about double or one-half of the ~~mapped correlated~~ heart rate signal, means for withholding delivery of the extra-systolic stimulation therapy.

55. (currently amended) A system according to claim 54, further comprising:  
means for applying an arrhythmia detection technique; and  
~~in the event that an arrhythmia is detected,~~ means for attempting to terminate ~~an~~ the arrhythmia detected by the means for applying.

56. (currently amended) A ~~system method~~ according to claim 55, wherein the means for attempting to terminate the arrhythmia comprises at least a one of:  
means for providing an anti-tachycardia pacing therapy, means for providing a cardioversion therapy, means for providing a defibrillation therapy, means for providing a burst-type pacing therapy, means for providing a ramp-type pacing therapy.